

IV.G.5 Residential Fuel Cell Demonstration by the Delaware County Electric Cooperative, Inc. (New Project)*

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Subcontractors:

1st Rochdale Cooperative Group, Ltd., New York, NY

National Rural Electric Cooperative Association (NRECA), Arlington, VA

**Congressionally directed project*

Objectives

- Validate propane-fueled hydrogen fuel cells for edge-of-grid residences via a field trial demonstration
 - measure and report technical performance
 - provide raw cost data and economic viability analysis
 - document maintenance and operations concept enhancements specific to residential fuel cells
 - share safety-related vulnerabilities analysis and lessons learned
 - promote education of state and local consumers

Technical Barriers

This project addresses the following technical barriers from the Fuel Cells and Technology Validation sections of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- I. Fuel Processor Startup/Transient Operation (Fuel Cells)
- I. Hydrogen and Electricity Coproduction (Technology Validation)

Approach

DCEC will evaluate alternative fuel cell technologies for rural residential applications to select the technology with the best combination of technical and economic feasibility. DCEC will install and operate a propane-fueled 5-kW residential fuel cell at a cooperative member's home. A grid-parallel installation will be utilized to provide a reliable energy supply to the host member and permit the degree of flexibility required by our fuel cell experiment. Thermal recovery of waste heat from

the fuel cell will be used for hot water and space heating within the residence.

Data collection will span a 12-month operational period. Data will be collected on each of the key technical performance measures listed below:

- Efficiency with and without thermal recovery
 - Electrical energy efficiency at rated power
 - Combined heat and power efficiency
- Cost
- Transient response

- Cold start time
- Survivability
- Durability
- Power quality
- Noise
- Emissions

Other data elements will also be monitored on a regular basis to permit parametric analysis at the conclusion of the operational period. These data elements are listed below:

- Temperature
- Humidity
- Propane odorant variations (constituents, odorants, heating value, etc.)
- In-service time

At the conclusion of the operational period, analysis will be performed on technical performance, economic viability, safety, and operations and maintenance concepts. The combined operation of fuel cells with intelligent energy storage will be of particular interest during the analysis phase.